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WESTON

MODEL 7320
DIGITAL MULTIMETER
INSTRUCTION MANUAL

OPERATING INSTRUCTIONS

for

DIGITAL MULTIMETER

WESTON® MODEL 7320

U.S. Patent 4,321,530

Copyright 1982

F4078-999
7/82

Printed in U.S.A.

SAFETY NOTICE

WESTON EXERTS EVERY EFFORT TO INSURE THAT THIS INSTRUMENT WILL PROVIDE SAFE DEPENDABLE SERVICE. HOWEVER, TO AVOID PERSONAL INJURY, OPERATORS AND MAINTENANCE PERSONNEL ARE URGED TO ACQUAINT THEMSELVES WITH THIS ENTIRE MANUAL BEFORE USING THIS INSTRUMENT.

SAFETY LEADS ARE SUPPLIED WITH THIS INSTRUMENT TO PROTECT THE OPERATOR FROM ELECTRICAL SHOCK. THE BANANA PLUGS ARE FULLY SHROUDED AND THE TEST PROBES INCORPORATE A FINGER GUARD AND ANTI-SLIP GROOVES FOR FIRM SECURE HANDLING. BOTH FEATURES OFFER ADDITIONAL PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE METALLIC CONDUCTORS. TO AVOID INJURY, THE OPERATOR SHOULD USE ONLY THE SAFETY LEADS SUPPLIED AND SHOULD NOT USE CONVENTIONAL TEST LEADS WITH THIS INSTRUMENT.

OBSERVE OVERLOAD PROTECTION LIMITS STATED ON THE INSTRUMENT'S BOTTOM LABEL AND IN INSTRUMENT PROTECTION PARAGRAPH PAGE 8.

FOR SERVICING OR BATTERY REPLACEMENT, REMOVE THE TEST LEADS FROM THE INPUT TERMINAL JACKS. (SEE OPERATOR MAINTENANCE PAGE 24.)

AVOID CONTACT WITH ANY EXPOSED ENERGIZED ELECTRICAL CIRCUITS. BEFORE MAKING CONNECTIONS TO OR CHANGING THE POLARITY OF THE HIGH VOLTAGE CIRCUITS, ALWAYS FIRST DE-ENERGIZE THE CIRCUIT.

UNDER CERTAIN CONDITIONS, DANGEROUS POTENTIALS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE OFF POSITION DUE TO CHARGES RETAINED BY CAPACITORS. TO AVOID HAZARDS, ALWAYS REMOVE POWER AND DISCHARGE ALL CIRCUITS BY USE OF A GROUNDING STICK PRIOR TO TOUCHING THEM.

DANGEROUS ARCS OF AN EXPLOSIVE NATURE CAN OCCUR IF THE CIRCUIT IS SHORTED IN HIGH POWER CIRCUIT AREAS SUCH AS DISTRIBUTION TRANSFORMERS. ALWAYS SET THE FUNCTION AND RANGE SWITCHES OF THE INSTRUMENT TO THE CORRECT POSITIONS BEFORE TAKING MEASUREMENTS. WHEN TAKING VOLTAGE MEASUREMENTS, NEVER SET THE FUNCTION SWITCH TO THE RESISTANCE POSITION.

SAFETY SYMBOLS

THIS SYMBOL APPEARING ON THE INSTRUMENT WARNS THE USER TO REFER TO THE INSTRUCTION MANUAL FOR DETAILED INSTRUCTIONS.

THIS RED SYMBOL DESIGNATES A HIGH VOLTAGE TERMINAL, WITH RESPECT TO ANOTHER TERMINAL, WHICH MAY BE AT LIVE VOLTAGES EXCEEDING 1 KV AND THUS INDICATING THAT CONNECTING TO OR DISCONNECTING FROM MAY BE DANGEROUS.

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Figure 1. Weston Model 7320 Digital Multimeter

INTRODUCTION

The Weston Model 7320 is a portable autoranging autofunction digital multimeter. This high accuracy 3-1/2 digit instrument measures DC and AC voltage and resistance, and provides convenient continuity and diode test functions. All operations are performed with a single front panel switch. Housed in a shockproof and water-resistant case that fits in the palm of a hand, this multimeter provides features not available elsewhere.

The performance features include high measurement accuracy, resolution of 10 mV and 1 ohm, extremely long battery life, unusually high overload protection and completely insulated measuring jacks for user safety. For optimum convenience and simplicity of operation, and in keeping with state-of-the-art design, the multimeter embodies features such as DC/AC autofunction, voltage/resistance autorange, automatic sensing and indication of mixed AC and DC signals, autozero, autopolarity, continuity tone, diode drop measurement and audible tone, and complete display identification (via LCD annunciators) of selected function, overrange, and low battery condition.

This compact feature-packed high performance instrument is ideally suited for field service, repair shop, laboratory, classroom and home troubleshooting applications.

Before using this multimeter, read this manual to become familiar with its many features and recommended operating procedures.

FEATURES

VOLTAGE AUTOFUNCTION: Multimeter samples input and automatically selects AC or DC component for measurement.

LOW VOLTAGE AC INDICATION: Permits isolation of low voltage AC component for precise AC measurement. This feature is especially useful for power supply applications.

AUTORANGE: When measuring DC voltage, AC voltage, or resistance, multimeter automatically selects operating range with best resolution.

OVERRANGE INDICATIONS: Overrange condition in any selected function produces flashing display.

CONTINUITY TONE: In continuity mode, multimeter emits continuous audible tone when resistance connected across input jacks is less than 10 ohms. Tone response is immediate; ideal for quick multiple continuity measurements.

DIODE TESTS: Unit verifies forward conduction of diode elements and displays forward voltage drops below 2 volts. Continuous tone accompanies readout when less than 2 volts.

EASY-TO-READ LCD DISPLAY: High contrast glareproof 3-1/2 digit liquid crystal display. 0.4" high digits provide readings that range from 000 to 1999. Display includes 3-position decimal point, "-" polarity sign and the following automatically controlled annunciators: DC, AC, V, kΩ, BT, ⊣◀⊢ , and ♪ .

HIGH OVERLOAD PROTECTION: Instrument protected from damage on all ranges without replacing fuses. Depending on function, calibration is either not changed or is restored automatically within a few minutes.

LONG BATTERY LIFE: Using 9-volt alkaline transistor battery, typical battery life is 200 hours, corresponding to many months of periodic use.

LOW BATTERY ANNUNCIATOR: BT annunciator automatically activated when battery voltage drops approximately 25%, alerting user to replace battery.

SIMPLE SINGLE KNOB OPERATION: All measurement functions selected by single rotary switch with spring-actuated roller detent action.

Annunciators in display identify selected function as well as any special operating conditions such as overrange, low battery, and presence of AC signal in DC measurements.

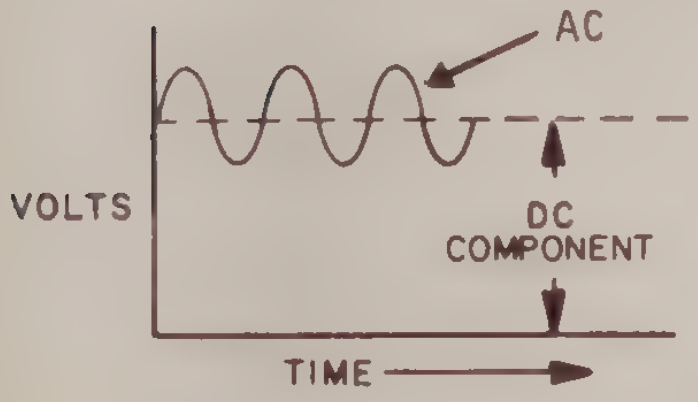
SAFETY JACKS AND TEST LEADS: Two measurement jacks are deeply recessed and accept shrouded banana plugs (supplied with instrument). Since no metal contacts are exposed (even if plugs are not fully seated), meter may be used with complete safety.

RUGGEDIZED CONSTRUCTION: Sealed, shockproof, fully water resistant and dustproof. Case is equipped with retractable folding handle for carrying, hanging or tilt stand use.

ACCESSORIES: Standard accessories include safety test leads, soft vinyl carrying case and instruction manual. Optional accessories available: temperature probe, RF voltage probe, VHF RF probe and high voltage probe.

SPECIFICATIONS*

VOLTAGE (AC/DC)

Autofunction	Input Voltage	Measurement Mode Selected	Annunciator(s)
	DC with AC < 2V	DC	DC V
	DC with 2V < AC < 20V	DC	DC V with AC flashing.
	DC with AC > 20V	AC	AC V

Ranges

0.00 to 19.99 volts DC

20.0 to 199.9 volts AC or DC

200 to 600 volts AC

Accuracy

DC: 0.1% of reading ± 1 digit

AC: 1% of reading ± 5 digits (45 Hz-1KHz)

*18°-28°C, 0-60% Relative Humidity, 2 Years.

DC Polarity Indication	"-" sign for negative values
Input Impedance	10 Megohm
Normal Mode Rejection Ratio	> 55 dB at 50 or 60 Hz
Common Mode Rejection Ratio	>100 dB

LOW VOLTAGE AC

Range	Single fixed range: 0.00 to 19.99 volts AC
Accuracy	1% of reading ±5 digits AC (45 Hz - 1 KHz)

CONTINUITY (AUDIBLE TONE)

Tone Threshold	<10 ohms ±20%
Tone Delay	<30 mSec after shorted input is applied
Open Circuit Voltage	<5V

RESISTANCE (LOW VOLTAGE AUTORANGE)

Ranges	0.00 to 19.99 Kilohms
	20.0 to 199.9 Kilohms
	200 to 1999 Kilohms
Accuracy	0.5% of reading ± 1 digit
Open Circuit Voltage	< 0.45V

DIODE TEST (FORWARD VOLTAGE DROP AND TONE)

Display	Forward voltage drop, V_f ± 0.5%
	± 2 digits and tone up to 2V
Tone Threshold	<1.8V
Open Circuit Output Voltage	>2.1V
	<5.0V

INSTRUMENT PROTECTION

DC and AC Voltage Functions	1000 VDC or 750 VAC continuous without damaging unit or changing its calibration.
Continuity, Resistance and Diode Test Functions	300 VDC or 300 VAC continuous without damaging instrument. Calibration is restored automatically within 2 minutes.

ENVIRONMENTAL

Operating Temperature Range	0^{o} - 50^{o}C
Operating Humidity	< 90% non-condensing @ 0-35^{o}C < 80% non-condensing @ 35^{o}-50^{o}C
Storage Temperature	-20^{o} to $+60^{o}$C
Temperature Coefficient	0.1 times applicable accuracy per ^{o}C

POWER SOURCE	Single 9-volt transistor battery (NEDA 1604)
BATTERY LIFE	200 hours typ. with alkaline battery

DIMENSIONS	3-1/4" x 5-1/2" x 1-3/8" (8.25 cm x 14 cm x 3.5 cm)
WEIGHT	12 oz. (340 g)
STANDARD ACCESSORIES (supplied with instrument)	Test leads with shrouded banana plugs (P/N 283365-901)
	Soft vinyl carrying case (Catalog No. 9428-4985901)
	Instruction manual (P/N F4076-999)
	Battery (P/N 276304-001)

Temperature Probe - Catalog Number 9428-3023901

Probe plugs directly into Hi and Lo jacks to provide a direct reading in °C or in °F (switch-selectable) of temperature at the probe tip sensor. Temperature is read directly in degrees (C or F), ignoring the decimal point.

Celsius Range:	-50° to 150°
Fahrenheit Range:	-58° to 302°
Resolution:	1°
Accuracy:	±1.7° from 0°C to 100°C
	±3°C from -50°C to 150°C
Settling Time:	10 seconds maximum, to rated accuracy, with full immersion
Voltage on Probe Tip:	500 Volts maximum
Readout Sensitivity:	10 mV/degree

RF Voltage Probe - Catalog Number 9970-271961

Passive diode probe which may be connected to Hi and Lo jacks to extend AC frequency range for voltage measurement.
Probe tip is signal input with separate ground connection provided by alligator clip.

Input Voltage:	1 to 30 Volts RMS
Accuracy:	±5% of input
Frequency Range:	10 KHz to 50 MHz
Input Impedance:	10 MΩ

VHF RF Probe - Catalog Number 9740-279627

This probe extends AC frequency range for voltage measurements.
Probe tip is signal input with separate ground connection provided by an alligator clip.

Input Voltage:	.25 to 30 Volts RMS
Accuracy:	±5% of input
Frequency Range:	50 KHz to 520 MHz
Input Impedance:	10 MΩ

High Voltage Probe - Catalog Number 9740-279395

This probe extends DC voltage range to 50 KV. Probe tip is signal input with separate ground connection provided by an alligator clip. Probe output voltage is 1% of probe input voltage. The rugged plastic housing is formed to prevent user's hand from accidentally contacting the high voltage source.

Input Voltage:	0 to 50,000 Volts DC
Accuracy:	±2% of input
Input Impedance:	1000 MΩ
Attentuation Ratio:	100:1

OPERATING CONTROLS, DISPLAYS AND JACKS (See figure 2)

All operations of this instrument are controlled by a single rotary selector switch, with inputs applied to the two input jacks via a pair of test leads. The numerical readout and associated annunciators are prominently displayed on the LCD readout. Table 1 describes the functions of the switch, display, and jacks on the front panel.

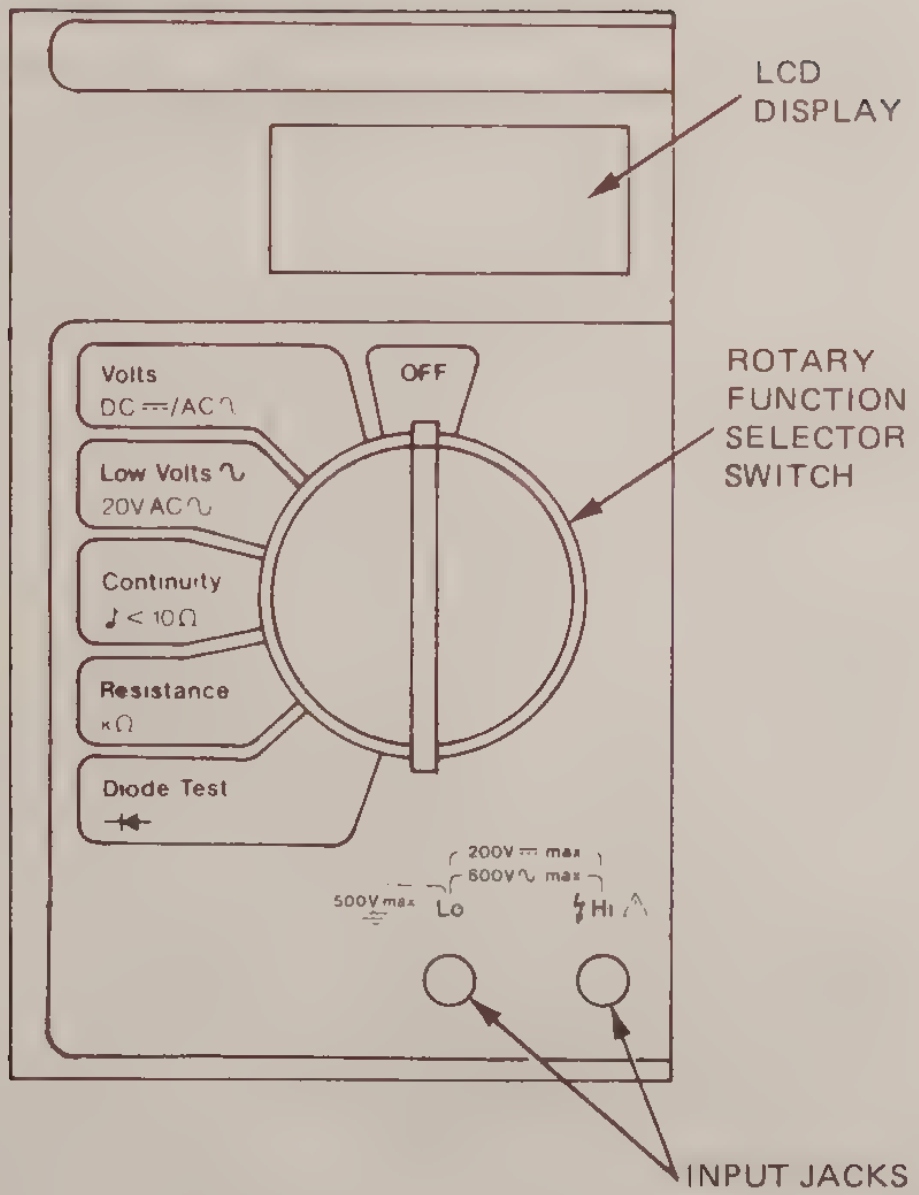


Figure 2. Multimeter Front Panel

Table 1. Functions of Front Panel Features

Name	Function		
Function selector switch	Switch Position		Annunciators
	OFF	Turns off instrument	
	Volts DC ⎓ / AC ∿	DC or AC voltage measurements (autofunction, autorange)	DC V or AC V or DC V AC*
	Low Volts ∿ 20VAC ∿	Low voltage (0-20V) AC measurements	AC V
	Continuity ♪ < 10	Provides continuous tone when measured resistance is less than 10 ohms	♪ 0.00
	Resistance, kΩ	Resistance measurements	kΩ
	Diode test	Measures forward diode drop < 2V and provides continuous tone	⊣ V

*Indicates AC flashing

Display	3-1/2 digit LCD readout (1999 max) with automatic decimal point position and minus sign indication for negative values. Numerical display indicates measured values; annunciators display selected function and any related operating conditions such as overrange, presence of significant AC component in a DC voltage and low battery.
Lo Input Jack	Recessed connector used as common input for all measurements. Accepts shrouded or standard banana plug.
Hi Input Jack	Recessed connector used as high input for all measurements. Accepts shrouded or standard banana plug.

OPERATING INSTRUCTIONS

Battery Installation

Install the battery supplied with the instrument as described under "Operator Maintenance." (See page 24.)

Test Lead Connections

For all measurements, connect the black test lead to the Lo input jack and the red lead to the Hi input jack of the multimeter.

DC and AC Voltage Measurements

The Volts setting of the selector switch is the simplest function to use since AC/DC and range selection are automatic. Proceed as follows:

a. Connect the test leads across the points to be measured.

b. The autofunction circuits will select either DC or AC voltage for measurement and the autoranging circuits will select the range that provides the best resolution.

   If AC $< 20V$, DC voltage is measured.
   If AC $> 20V$, AC voltage is measured.
   The DC or AC annunciator will appear to indicate which function has been selected.

NOTE

If the DC annunciator is on but the AC annunciator is flashing, the source being measured has an AC component between 2V and 20V in amplitude. To measure this voltage, rotate the selector switch to the Low Volts position.

Low Voltage AC Measurements

Rotate the selector switch to Low Volts and connect the test leads across the points to be measured. Note that this is a fixed 0-20V AC range. Also note that if there is a DC component greater than 200V, low voltage AC accuracy may be degraded.

Continuity Test

Rotate the selector switch to Continuity. Note that the numerical readout remains at 0.00. Connect the test leads across the circuit to be tested. If the measured resistance is less than 10 ohms, a tone sounds. This feature provides a convenient method of performing a series of continuity checks without having to read a display.

Resistance Measurements

Rotate the selector switch to Resistance and connect the test leads across the resistance to be measured. The autoranging circuits automatically select the resistance range that produces the best resolution.

NOTE

All resistance readouts displayed are in kilohms.

Diode Tests

This test function measures the forward voltage drop of diodes when less than 2V, at 1 mA of current. Connect the red test lead to the anode of the diode and the black lead to the cathode. A continuous tone accompanies this measurement. Note that no measurement or tone is produced if the test leads are reversed.

Tilt Stand

To configure the handle as a tilt stand, extend the handle to its carrying position, then swing it back until it locks in place. (See figure 1.)

OPERATING CONSIDERATIONS

Input Overload Protection

Input overload protection is provided for each measurement function. Overload limits for each function are given in Table 2.

WARNING

TO AVOID PERSONAL INJURY OR DAMAGE TO THE INSTRUMENT, DO NOT EXCEED THE OVERLOAD PROTECTION LIMITS SPECIFIED BELOW.

Table 2. Input Overload Limits

Function	Maximum Input Overload
Volts, Low Volts	1000 VDC or 750 VAC RMS
*Continuity, kΩ, Diode Test	300 VDC or 300 VAC RMS

*If 300V AC or DC is applied during these measurement functions, a time delay (up to 2 minutes) may be required to permit recovery of calibrated level.

Display Characteristics

This displayed value may range from 000 to 1999. The decimal point is automatically positioned for the proper reading.

If the input signal is negative with respect to the LO input terminal, the minus ("-") sign is activated. If no sign is displayed, the measured value is positive with respect to the LO terminal.

NOTE

The minus sign may flash momentarily when the instrument is turned on or the selector switch is rotated. This has no significance.

Three abnormal condition indicators may appear on the display:

1) A flashing numerical display indicating an overrange condition.

   Remedy: Reduce input level.

NOTE

A flashing display in Resistance or Diode Test functions does not represent an abnormal condition; this display occurs when the input is open (test leads not connected to resistor or diode reverse biased).

2) BT annunciator appears.

Remedy: Replace weak battery.

3) Flashing AC annunciator.

Remedy: None. Multimeter is reading the DC voltage level. User is directed to switch to LO Volts function to measure AC component in the applied voltage.

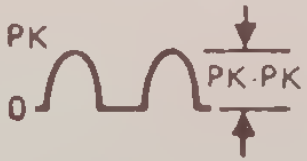
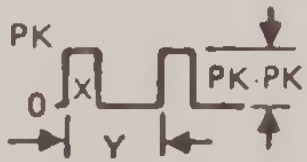
OPERATING NOTES

AC Measurements

This instrument employs an average responding converter which measures the average value of the full-wave rectified signal. The meter displays an equivalent RMS value which is 1.11 times the average value.

For a pure sine wave, the displayed value is the true RMS value. As the waveform deviates from the pure sine wave, the difference between true RMS and equivalent RMS values increases. Table 3 provides conversion factors between true RMS and equivalent RMS values for various common waveforms.

Table 3. Conversion Factors

Input Waveform	PK-PK	0-PK	Equivalent RMS (7320 Display)
Sine	2.828	1.414	1.000
Rectified Sine (Full Wave)	1.414	1.414	0.421
Rectified Sine (Half Wave) 	2.000	2.000	0.764
Square	2.000	1.000	1.110
Rectified Square	1.414	1.414	0.785
Rectified Pulse 	2.000	2.000	$2.22\ (D-D^2)$ $(D = X/Y)$
Triangle Sawtooth	3.464	1.732	0.960

Circuit Loading Error in Voltage Measurements

Measurement error produced by circuit loading can occur when making voltage measurements on circuits with high source impedance. However, the error is negligable in most cases as long as source impedance is small with respect to the 10 megohm input impedance of the meter. The magnitude of this error may be calculated as follows:

1) DC Voltage Measurements:

$$\% \text{ Error} = 100 \times \frac{R_s}{R_s + 10^7}$$

Where R_s = Source resistance, in ohms, of circuit being measured.

2) AC Voltage Measurements:

$$\% \text{ Error} = 100 \times \frac{Z_s}{Z_s = Z_{in}}$$

Where Z_s = source impedance

$$Z_{in} = \frac{10^6}{1 + 15 \pi f (10^{-5})}$$

Where f = frequency in Hz.

WARNING

Before removing the battery cover be sure to disconnect the test leads from any external equipment. Failure to observe this precaution may cause equipment damage and possibly expose the user to a safety hazard.

Battery Installation

The digital multimeter is designed to operate with a single 9V battery (NEDA 1604) of the type commonly used for transistor radios. If an alkaline battery is used, operating life up to 200 hours may be expected; about 100 hours with a carbon-zinc battery. When battery voltage drops below 6.8 volts, the low battery (BT) annunciator appears constantly on the display to alert the user of this condition.

To install or replace the battery, proceed as follows:

a. Set the selector switch to OFF and remove the test leads from the input jacks.

b. Place multimeter, face down, on a table or workbench.

c. Pry up locking tab (figure 3) to release the top of the battery cover, then remove cover from case. An O-ring (P/N 284978-901) fits into a groove in the battery cover. Note that the handle, held captive by the cover, is freed when the cover is removed. Temporarily place the cover and handle aside.

d. To replace a battery, carefully pull the battery clip off the battery terminals and discard the old battery.

e. Observing the polarity of the battery terminals, snap the battery clip to the terminals of the replacement battery.

f. Insert the attached battery into the battery compartment. Dress the battery cable within the recessed area so that it will not block the battery cover. (See figure 4.)

g. Place the multimeter handle in the slots at the sides of the battery compartment so that the square tabs clear the corner projections. Holding the handle in this position, replace the battery cover, being careful to retain proper fit of sealing gasket. Slide the bottom tabs on the cover into the case. Be sure to snap cover closed.

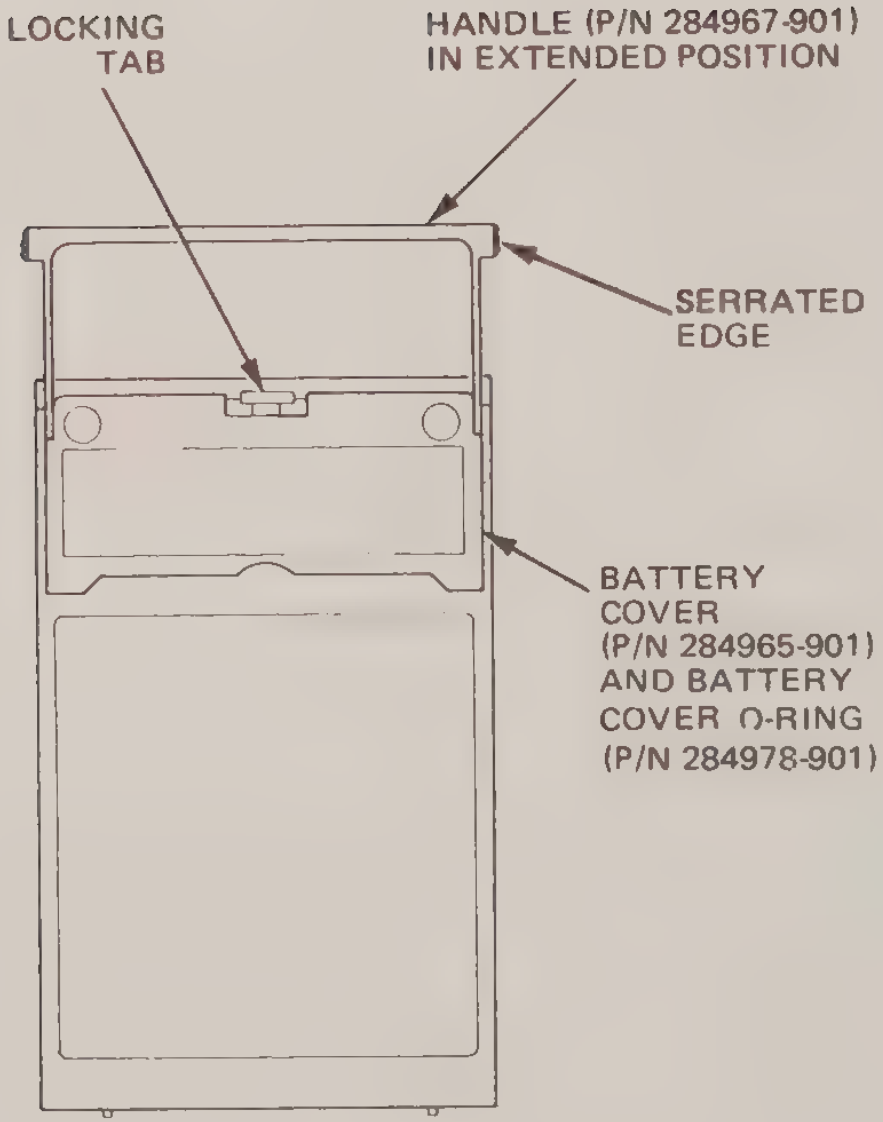


Figure 3. Rear View of Multimeter

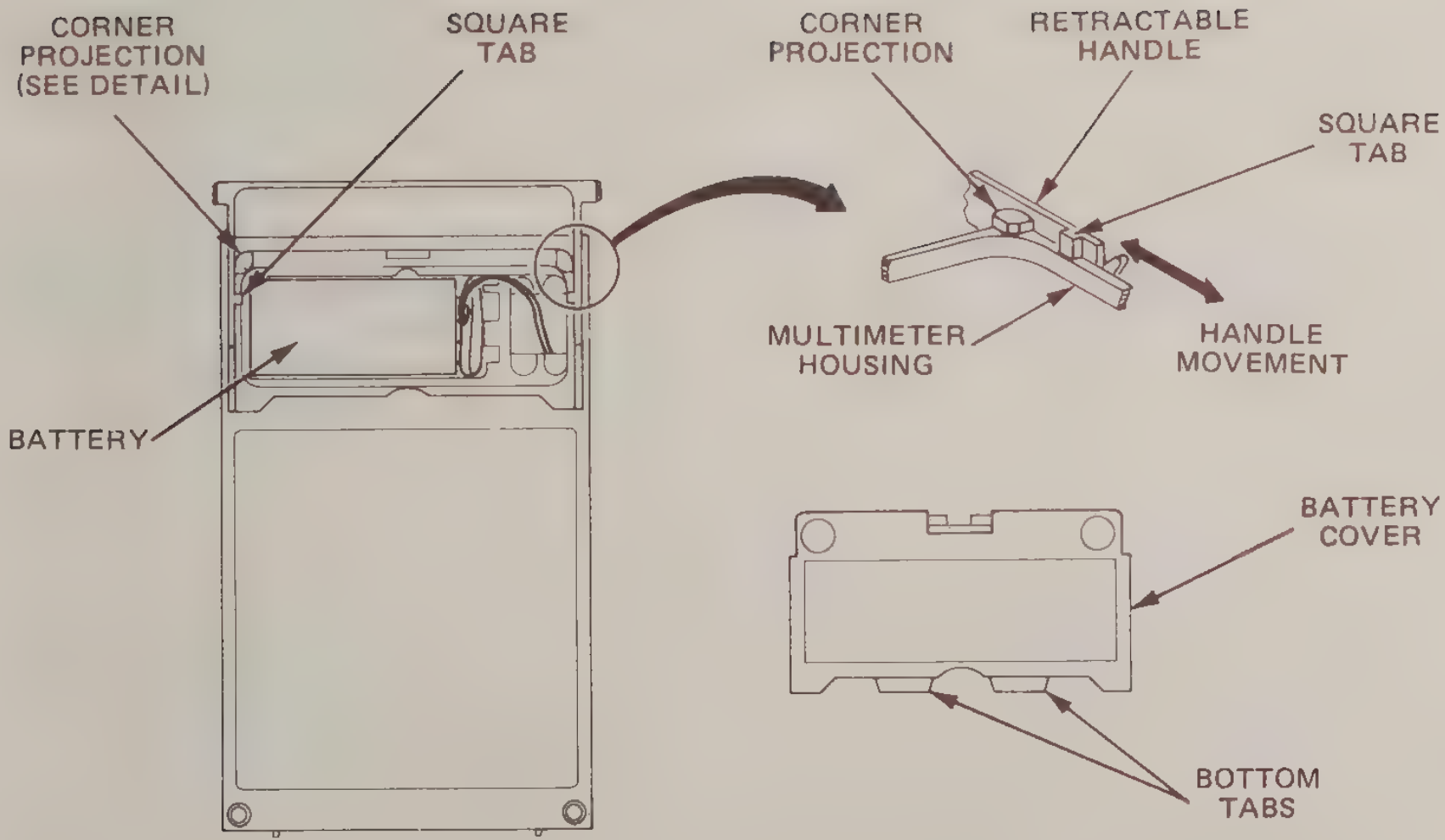


Figure 4. Rear View, Battery Cover Removed

Switch Detent

Spring actuated rollers provide very positive detent action for the rotary selector switch. If, for any reason, the knob is removed, the rollers and springs may pop out. Figure 5 shows the switch detent arrangement and identifies the detent rollers and springs by part number.

Factory Repair

If factory repair is desired, contact the Weston Instruments Servicenter listed below for instructions. Overseas customers should contact their sales agent.

United States

Weston Instruments
7870 Airport Highway
Pennsauken, N.J. 08109
(609) 488-0474

Canada

Weston Instruments
1200 Aerowood Drive
Mississauga, Ontario,
Canada L4W 2S7
(416) 624-6660

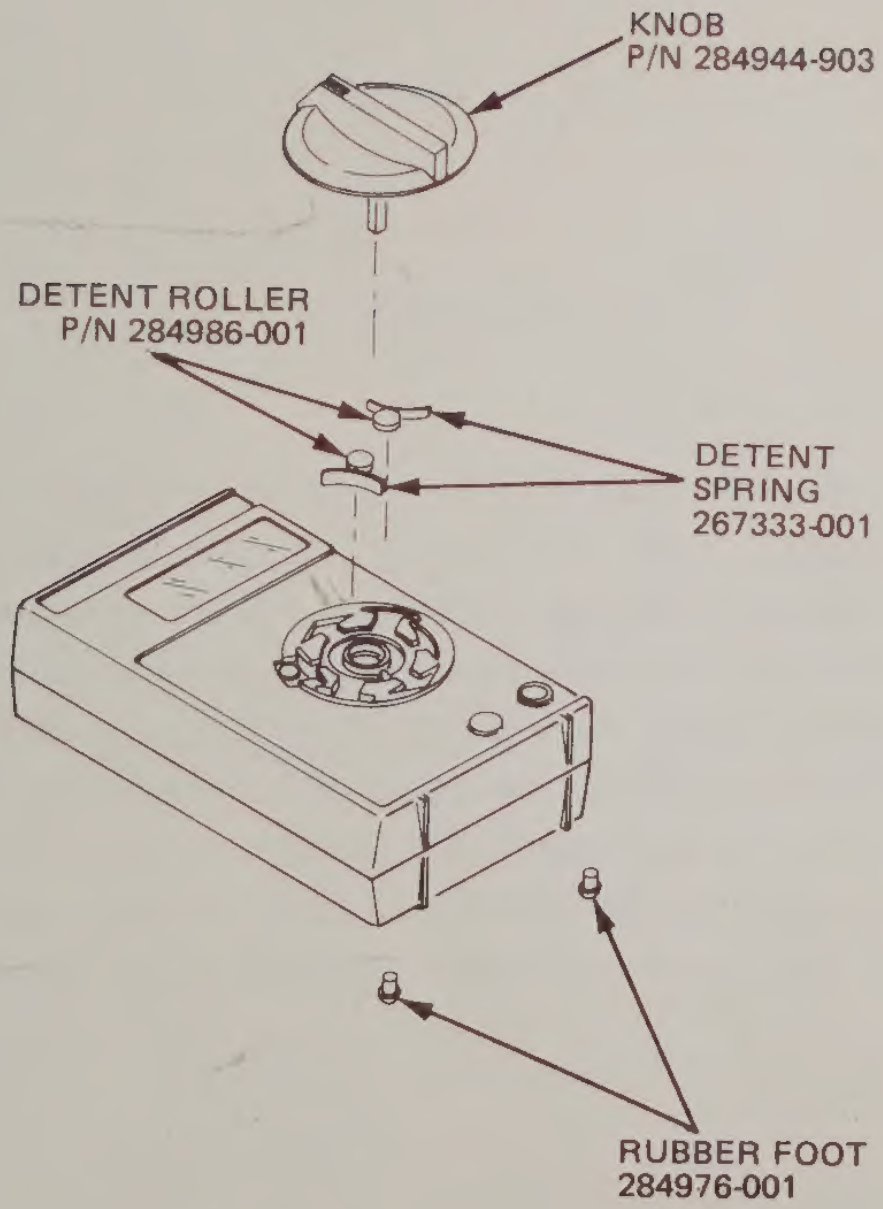
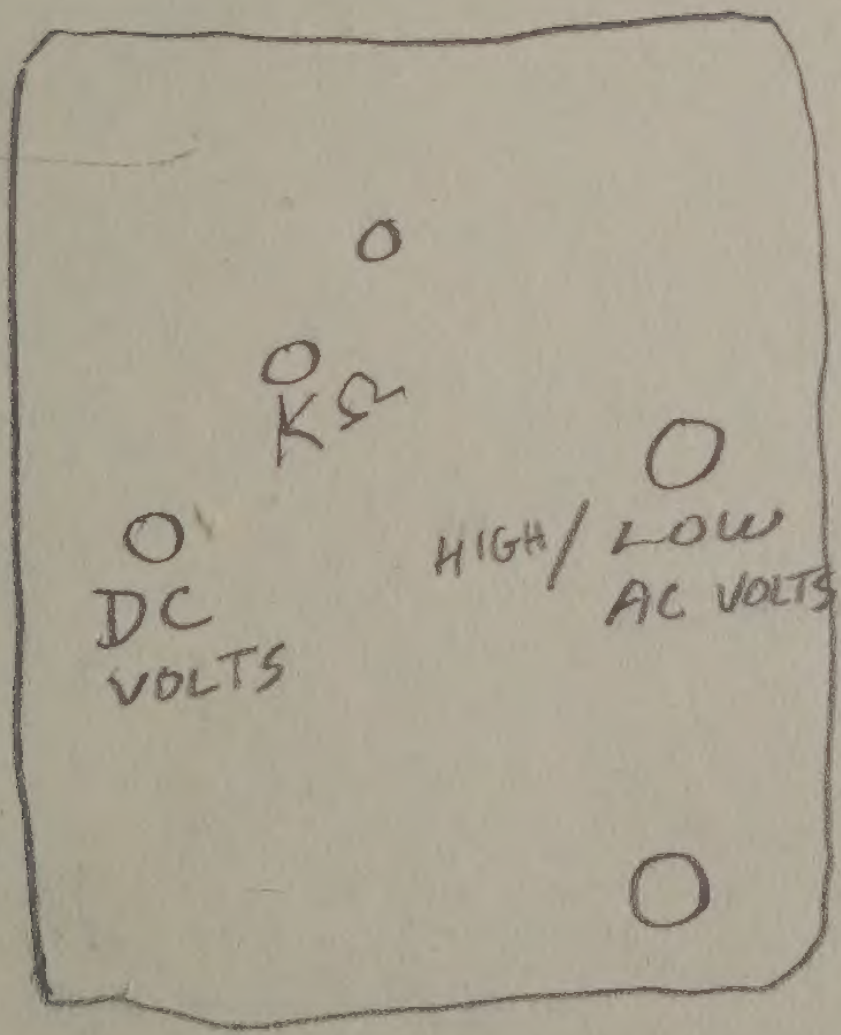


Figure 5. Operator Replaceable Parts

WARRANTY

Weston products are warranted to be of good workmanship and quality and free from defects. Our liability is limited to replacing the instrument or any part thereof except batteries, if our examination shall disclose it to have been defective under proper and normal use, provided it is returned prepaid to a Weston Authorized Sales-Servicenter, as directed by Weston, within one year after the date of purchase. We shall not be liable for consequential damages of any kind. This warranty is in lieu of all other warranties, liabilities, or obligations, statuatory or implied, to the original purchaser or to any other person.


KΩ
DC
VOLTS
HIGH/ LOW
AC VOLTS

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